

the connection of the axial canals no longer occurs, though secondary development still results in the formation of a connected skeleton, and in which there are no special needles developed besides the regular hexacts. On this phylogenetic theory, *Eurete*" (which according to Marshall is entirely without isolated siliceous elements) "is of importance, while an ontogenetic recapitulation of the development is illustrated by the extremely simple embryo of *Hyalonema*, which I (Marshall) have described."

From the still extant genus *Sclerothamnus*, representing the ancestral form, Marshall derives the group of Synauloidæ, in which "the lumina of the spicules, as well as the spicules themselves, are continuously connected with one another, so that the whole lattice-work of the sponge is penetrated by a uniformly connected system of tubes." The other modern Hexactinellida are united by Marshall into the group Asynauloidæ, "in which the lumina of the stalks of the various spicules are never connected, but each spicule, so far as its central filaments are concerned, forms an independently developed individual. Where a lattice-work is developed, that is exclusively the result of a syncytium formed by the secretion of layers of siliceous material."

We thus see that Marshall regards the presence of a special form of dictyonal framework as the oldest type of Hexactinellid skeleton, from which the forms described as Lyssacina (with isolated hexradiate spicules) have afterwards developed. In many of the latter a secondary union of the hexradiate spicules again results in the formation of a connected siliceous framework (the dictyonal framework of our Dictyonina), and at first of this alone, as in *Eurete*, but afterwards also with the association of adjacent isolated spicules. In other derived forms the secondary fusion of the spicules has not occurred, but the form of the isolated spicules has become more or less complicated.

In 1877, in his *Studies on Fossil Sponges*,<sup>1</sup> Zittel applied the results of his investigation of abundant palæontological material to the elucidation of the system and phylogeny of the Hexactinellida. His conclusions agree in several points with those of Marshall, but differ not inconsiderably in others. "Were it true," Zittel says (*loc. cit.*, p. 19), "that the compact Hexactinellid skeleton was developed from a special framework of delicate protoplasmic strands, then the older fossil forms must necessarily, on Marshall's theory, belong to the Synauloidæ. This is not, however, by any means the case. My researches on fossil forms have shown that the connected lattice-works consist without exception of fused hexradiate spicules, in which the axial canals are indeed frequently apposed and seem to form closed and connected tubes, but are in reality always separate, while they usually lie, as in the living genera *Farrea*, *Eurete*, and *Aphrocallistes* so that the axial filaments of the different hexacts are seen to be distinctly separate."

After Zittel had shown that, even in *Sclerothamnus*, the axial canals of the lattice framework do *not* form an open anastomosis, but are referable throughout to single

<sup>1</sup> *Abhandl. d. II. Cl. k. bair. Akad. d. Wiss.*, Bd. xiii. Abth. 1.